NATIONAL AIRSPACE INTEGRATED LOGISTICS SUPPORT (NAILS) MASTER PLAN

MARCH 1987

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

Distribution: A-W(DL/AD/HR/AT)-2;
A-W(ES/PM/AP/LG/PT/TR/TO/FS)-3;
A-X-2; A-YZ-3; A-X(AF)-3

Initiated By: AES-110

FOREWORD

The National Airspace Integrated Logistics Support (NAILS) Master Plan issued July 1986 is replaced by this issue which has been reformatted to FAA directive format in accordance with Order 1320.1C.

The NAILS Master Plan provides requirements and task descriptions governing the implementation of a NAILS program for National Airspace System (NAS) equipment.

The goal of this plan is to develop a single, uniform approach for conducting those activities necessary to (1) cause supportability requirements to be an integral part of system requirements and design, (2) define support requirements that are optimally related to the design and to each other, (3) define the required support during the operational phase, and (4) prepare attendant data products.

This plan identifies specific requirements and tasks, as well as roles and responsibilities, which, when performed in an iterative and timely manner, constitute the NAILS program for the NAS.

This plan is applicable to all NAS acquisitions.

Edwin S. Harris, Jr.
Associate Administrator for
Development and Logistics, ADL-1

TABLE OF CONTENTS

CHAPTER 1. GENERAL

* 1. PURPOSE. The NAILS Master Plan is designed to identify NAILS requirements and explain how project NAILS programs are incorporated into the overall NAS structure. The policies outlined in the NAILS Master Plan are applied to each project by the project Integrated Logistics Support Plan (ILSP). The principal tool for identifying and documenting support resource requirements is the Logistics Support Analysis (LSA). *

2. DISTRIBUTION. This plan is distributed to the division level in the Offices of the Associate Administrators of Development and Logistics, Human Resource Management, and Air Traffic; branch level in the Systems Engineering Service, Program Engineering and Maintenance Service, Advanced Automation Program Office, Acquisition and Materiel Service, Personnel and Technical Training, Air Traffic Plans and Requirements Service, Air Traffic Operations
* Service, and the Office of Flight Standards; division level to all regions; branch level to regional Airway Facilities Divisions, and to branch level in the Aeronautical Center and the FAA Technical Center. *

* 3. NAILS POLICY. Notice N1800.127 establishes procedures for the NAILS process for NAS subsystem/equipment acquisitions, modifications, and applicable research and development projects. The NAILS Policy Order 1800.XX, which is undergoing final review, will establish the national policy. This policy is applicable to all FAA organizations. *

* 4. NAILS POLICY RESPONSIBILITIES. The Associate Administrator for Development and Logistics, ADL-1, has the overall responsibility for the development and implementation of NAILS policy on NAS Plan projects. Other organizations responsible for implementation and execution of the processes stated in the NAILS Master Plan include: *

a. Systems Engineering Service (AES). This service is responsible for the development, monitoring, and maintenance of the NAILS policy and this plan. It is also responsible for the monitoring of related plans and standards for conformance to the NAILS policy.

b. Program Engineering and Maintenance Service (APM). This service is responsible for implementing the NAILS process and the development and maintenance of related directives. APM is also responsible for implementing and monitoring NAILS efforts on project acquisitions. APM-12 is responsible for the initial budget line required for a NAILS program, with follow-on budget management to be managed by the cluster organizations.

c. Office of Personnel and Technical Training (APT). This office is responsible for the development of personnel and training standards, procedures, and systems to support the NAILS process.

d. Acquisition and Materiel Service (ALG). This service is responsible for the development of required acquisition policies, plans, and standards required to support the NAILS process.

e. Mike Monroney Aeronautical Center (AAC). The Aeronautical Center is responsible for the training, repair, and materiel system(s) required to support the NAILS process.

f. FAA Technical Center (ACT). The ACT is responsible for supportability testing and verification of NAS subsystems.

* g. FAA Regional Offices. Regional offices are responsible for the management of field support resources required for the NAS and for maintenance of NAS subsystems. *

* 5. MAINTENANCE ROLES AND RESPONSIBILITIES. The Airway Facilities Sector (AFS) will continue to be the principal organizational element in the maintenance program. The following paragraphs further detail the organizations involved in maintaining NAS subsystems. *

a. Regional/Offices/Washington Headquarters. The NAS Plan will increase the need for technical support of national programs through the regional AF Divisions to accomplish functions that are not practical to delegate to the sectors. The following are representative examples of such functions; frequency management, airspace reviews, technical inspection programs, coordination of technical support requirements, etc.

b. National Field Support Sectors (NFSS). NFSS's will provide second-level engineering support with an emphasis on resolution of systemwide and national problems associated with system integration and implementation, as well as engineering support, for the resolution of difficult local problems. The NFSS's perform the following functions; analyze and correct systemwide or national problems, assist sectors in diagnosing difficult site problems, develop and control hardware and software modifications, and provide functional improvement to diagnostics, test, maintenance, and utility programs.

* c. FAA Depot. The FAA Depot will provide repair of unserviceable reparable items requiring specialized repair procedures, test equipment/tools, diagnostic hardware/software, and major shop facilities. Examples of such activities include: repair, alignment, and calibration of complex equipment and modules; overhaul and rebuilding of equipment; performance of highly complex maintenance actions; and supply support. *

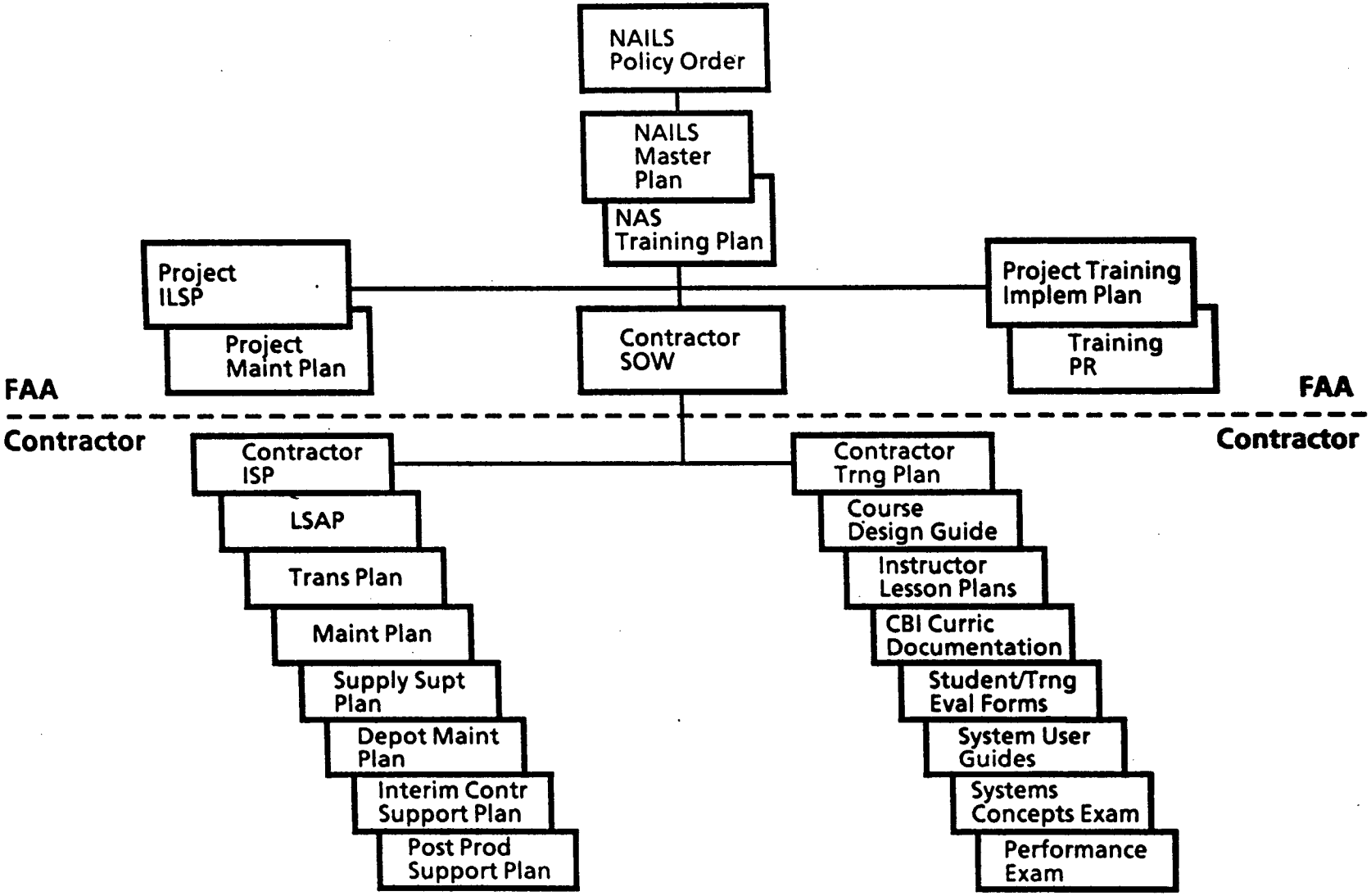
* d. FAA Academy. The FAA Academy will continue to provide indepth hands-on training for specific hardware/software systems. This training includes the development of multimedia courses used to support special training requests and Computer Based Instruction (CBI). The FAA Academy can provide direct technical support as required, and technical/administrative resources for regional training programs. *

e. Field Organization. Within each AF sector, the AF Sector Office is the headquarters for maintenance of all NAS subsystems located within the sector. The bulk of maintenance actions are carried out by Sector Field Offices (SFO) or their subordinate Sector Field Units (SFU). Within each sector will be at least one Maintenance Control Center (MCC). The MCC conducts real-time monitoring and remote control of NAS subsystems, as well as coordination and reporting of maintenance efforts. Maintenance Data Terminals (MDT) located at work centers (SFO and SFU) permit technical access to remotely-monitored subsystems. Portable MDT's permit specialists to monitor and control NAS subsystems either on site or from distant locations. Upon determination that a maintenance action is necessary, the cognizant work center dispatches a specialist, equipped with appropriate spares, support equipment, and publications, as well as a portable MDT. In general, the specialist will identify and remove the failed item, replace it, verify the functioning of the system involved, and return the removed item to the work center for further repair action, or for shipment to the FAA Depot. *

6. NAILS DOCUMENTATION HIERARCHY. The documentation hierarchy in figure 1-1 depicts the process involved in developing the required project support documentation. The key component within this structure is the NAILS Master Plan.

7.-10. RESERVED.

FIGURE 1-1. NAILS DOCUMENTATION HIERARCHY



CHAPTER 2. NAILS MANAGEMENT

11. OBJECTIVE. The primary objective of NAILS program management is to achieve NAS objectives at an economical life-cycle cost. Early NAILS program activity focuses on determining the required support characteristics and incorporating these requirements into system design. Subsequent activity focuses on acquisition, evaluation, and fielding of required support resources. A NAILS program will ensure the definition of tailored support needs and will identify, develop, and integrate logistics design constraints directed at reducing operational and maintenance costs. It will define NAILS within the system engineering process, and it will stress design considerations to incorporate maintainability and reliability criteria and applicable principles of NAILS to minimize the sum of acquisition, operation, and support costs. *

12. NAILS ELEMENTS. The NAILS objective will be met through intensive management of the following NAILS elements throughout the life cycle of the NAS subsystem projects:

a. Maintenance Planning.

b. Supply Support.

c. Support Equipment (SE).

d. Training and Training Support.

e. Direct-Work Staffing.

f. Maintenance Support Facilities.

g. Packaging, Handling, Storage, and Transportation (PHS&T).

h. Technical Data.

* i. Computer Resources Support (CRS). *

13. MANAGEMENT RESPONSIBILITIES MATRIX. The matrix in figure 2-1 depicts the roles and responsibilities of both the FAA and the System Engineering and Integration (SEI) contractor necessary to ensure that the NAILS program and its subordinate elements are carried out.

14. INTEGRATED LOGISTICS SUPPORT PLAN (ILSP). An ILSP is developed for each acquisition project. The purpose of the ILSP is to describe the Government's detailed approach for integrating logistics considerations and logistics planning into the engineering and design process for each NAS subsystem. In the ILSP, the Government provides support criteria and concepts for the NAILS program.

FIGURE 2-1. NAILS MANAGEMENT RESPONSIBILITIES MATRIX

NAILS ELEMENT:	CONCEPT EVALUATION	DEMONSTRATION AND VALIDATION	FULL-SCALE DEVELOPMENT	PRODUCTION AND IMPLEMENTATION
Maintenance Planning	AAC Depot AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100
Supply Support	AAC Depot AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100
Support Equipment	AAC Depot ACT-500 AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor	AAC Depot APM (Clusters) SEI Contractor
Training and Training Support	AAC Academy AAT-700 AES-100 ALG-200 APT-300 APM-100 APM (Clusters) SEI Contractor	AAC Academy APM (Clusters) SEI Contractor AAT-700 APM-100 APT-300	AAC Academy APM (Clusters) SEI Contractor AAT-700 APM-100 APT-300	AAC Academy APM (Clusters) SEI Contractor AAT-700 APM-100 APT-300
Manpower and Personnel	AAC Depot AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100
Maintenance Support Facilities	AAC Depot AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100
Packaging, Handling Storage & Transportation	AAC Depot AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100	AAC Depot APM (Clusters) SEI Contractor APM-100
Technical Data	AAC Depot AES-100 ALG-200 APM-100 APM (Clusters) SEI Contractor AAC Academy	APM-100 APM (Clusters) SEI Contractor AAC Academy	APM-100 APM (Clusters) SEI Contractor	APM-100 APM (Clusters) SEI Contractor
Computer Resources Support	AAC Depot AES-100 ALG-200 APM-100 ACT-500 ACT-100 APM (Clusters) AAC Academy SEI Contractor	AAC Depot APM (Clusters) AAC Academy ACT-500 ACT-100 SEI Contractor APM-100	AAC Depot APM (Clusters) ACT-500 ACT-100 SEI Contractor APM-100	AAC Depot APM (Clusters) ACT-500 ACT-100 SEI Contractor APM-100

The ILSP describes a phased program of Government and contractor actions which are dynamic and change with the progress of end item and NAILS development. Figure 2-2 identifies the major activities involved in a NAILS program and how these activities relate to major program milestones. The ILSP states Government requirements and will be updated as required during the life of the supported system.

15. INTEGRATED SUPPORT PLAN (ISP). A preliminary ISP will be developed by each project contractor in accordance with the Request for Proposal (RFP) and Statement of Work (SOW). This plan explains the contractor's approach for implementing the NAILS program for the system under contract. The preliminary plan will be submitted to the FAA for review and comment. After FAA approval, the ISP becomes the contractual document governing the contractor's NAILS effort. It is kept current throughout the contract period of performance. The ISP may include the following sub-plans, to the degree specified in the RFP/SOW.

a. Logistics Support Analysis Plan (LSAP). The LSAP is prepared by the contractor to describe the way in which the LSA effort is to be accomplished. The LSAP is normally submitted as part of the contractor's ISP; however, it can be delivered as a separate item. The LSAP covers the following topics:

(1) Work breakdown structure identification of items upon which LSA will be performed.

(2) An explanation of the LSA Control Number (LCN) system to be used.

(3) Procedures for incremental development and validation of LSA data to include data configuration control.

(4) The procedures, methods, and controls for identifying and recording design problems or deficiencies affecting supportability, corrective actions, and status of actions taken to resolve issues or concerns.

(5) A description of the contractor data to be delivered under the terms of the contract, and how the data will be delivered.

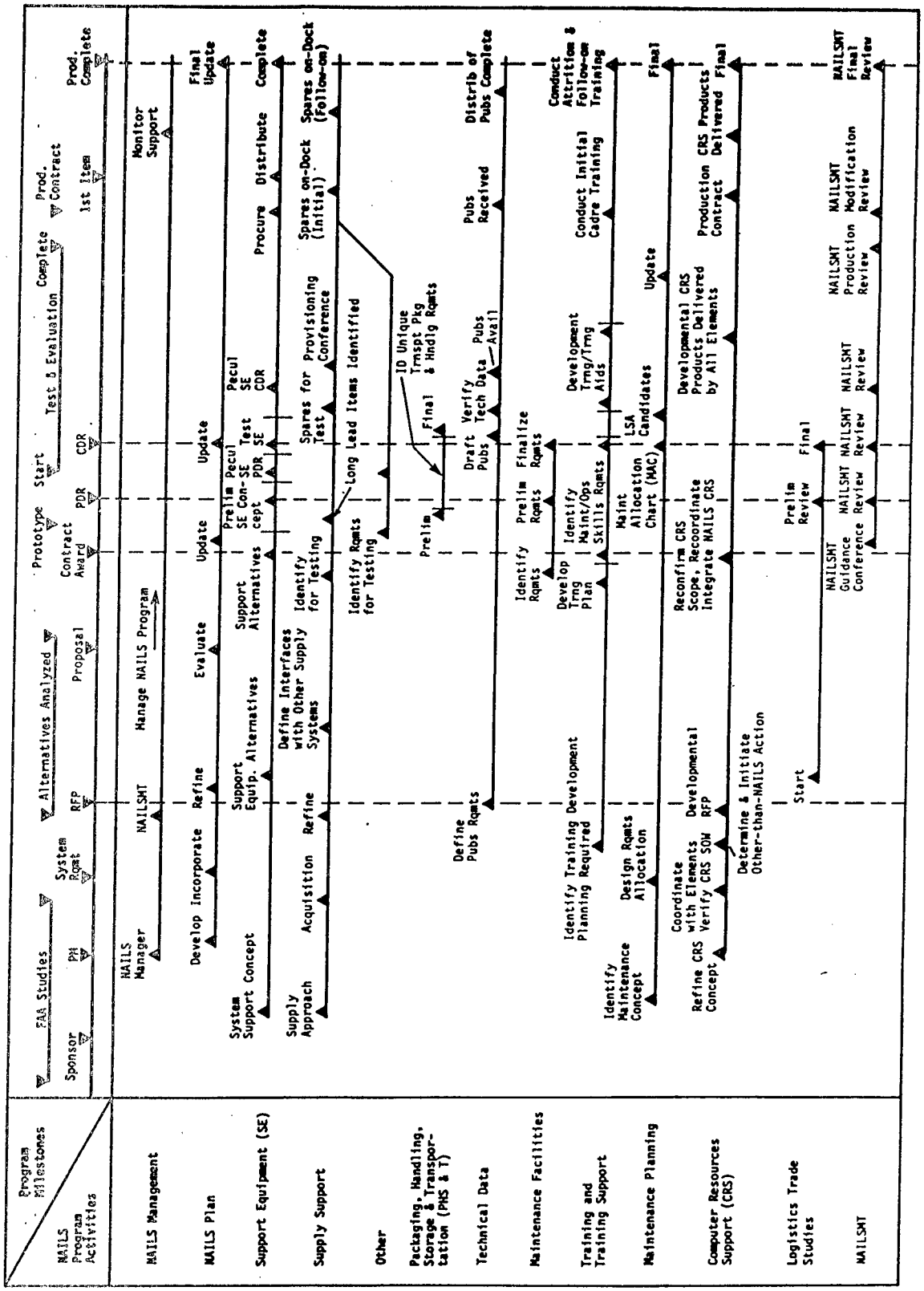
(6) An explanation of deviations from the standard Logistics Support Analysis Record (LSAR) format data sheets and new/modified data element definitions.

(7) Contractor and/or subcontractor/vendor Automatic Data Processing (ADP) capabilities and equipment for processing LSAR data.

(8) LSA program interfaces among:

(a) Reliability, maintainability, equipment design, human factors, safety, and other design-related activities.

FIGURE 2-2. NAILS ACTIVITIES BY PROGRAM MILESTONES



(b) The provisioning process.

(c) Technical/manual data development.

(d) Operator/maintenance training analysis.

b. Transportation Plan. This plan is developed by the contractor to describe the transportation requirements pertaining to the specific NAS subsystem. The Transportation Plan is normally developed during the acquisition phase and will be used by the shipment planning organization.

c. Maintenance Plan. The Maintenance Plan identifies the contractor's method for identifying and developing the required maintenance activities for system support. The plan provides a concise narrative of the maintenance actions, technical factors for each reparable item, and the identification of the system/equipment maintenance requirements.

d. Supply Support Plan. This plan provides the Government with the methodologies behind the contractor's proposed supply support system. The plan will identify the supply support requirements, as well as a recommended philosophy, to ensure that those requirements are available in a timely manner.

e. Depot Maintenance Plan. The Depot Maintenance Plan is essentially the documented results of a depot maintenance study, used to evaluate the manpower, skills, tooling, and facilities required for depot support. The plan identifies the steps required to ensure that the FAA Depot will be capable of supporting a particular NAS subsystem.

f. Interim Contractor Support Plan. This plan will detail the contractor's role (if any) in supporting the initial operation of a fielded subsystem. This support plan will also describe the requirements necessary to support a system between initial installation and the point in time when the FAA accepts support responsibility. In addition, this plan will describe the elements required to support the system test program to be accomplished by the contractor.

g. Post Production Support Plan. This plan identifies the logistics support resources required to support a subsystem/equipment for its remaining life following closure of the production lines. This plan will also include the methods recommended to satisfy the resource requirements.

16. CONTRACT TRAINING PLAN. A contractor-prepared document which outlines the strategy for training course development and conduct. It must be approved by the FAA contracting officer before development of the Course Design Guide (CDG) can proceed.

17. ADDITIONAL TRAINING DOCUMENTATION. The following documentation shall be prepared and delivered by the contractor to the degree specified in the RFP/SOW.

a. Course Design Guide. This guide translates an approved training plan into a blueprint for course development. It is useful to curriculum developers and supervisors during curriculum development and validation phases of course development.

* b. Instructor Lesson Plan. This plan is used to organize the instructor's presentation and to ensure that all required topics, subtopics, * and related reference materials are included in the presentation. This plan also provides the detailed technical data and information necessary to assist the instructor in the presentation of each lesson involved in the course.

c. Computer Based Instruction (CBI) Curriculum Documentation. The Program Logic for Automatic Teaching Operations Learning Management permits a wide range of adaptability in curriculum design. Specific design data are provided to establish the options for curricula selection in a standardized manner.

d. Student/Training Evaluation Forms. These forms are used to evaluate students' progress toward meeting course objectives. The evaluation program consists of pre-tests (if applicable), progress tests, and post-tests. Student progress is continuously evaluated by the instructor through class discussion, interviews, practical application exercises, and special projects, as well as written performance tests.

e. System User Guides. A "Quick Reference" or "How to" manual for FAA specialists who will be formatting messages or data entries, inputting and extracting data from system software, powering up/down a system, operating peripheral devices and changing control/switch/knob settings, initiating diagnostic or Built-in-Test Equipment (BITE) testing routines, and interpreting test result messages.

f. Systems Concepts Exam. An examination for which successful completion enables the examinee to be exempt from, or by-pass, formal course training. Also known as a "Theory of Operation" or "By-pass" exam, it is a written examination.

g. Performance Exam. An examination used to demonstrate proficiency by having the examinee make actual adjustments or software program changes and evaluate system/subsystem equipment operation.

18. LOGISTICS SUPPORT ANALYSIS. LSA is a series of analyses used to determine the logistics requirements for each of the NAILS elements. Examples of LSA data outputs include: number of spares; repair parts and consumables; consumption and usage rates; recommended allowances; supply storage requirements; maintenance concept; SE requirements; maintenance tasks; personnel requirements; and technical documentation.

* a. Logistics Support Analysis Record. Data and information generated by the LSA process is documented in a series of analysis worksheets called an LSAR. This record provides a common data input format for communicating logistics support requirements between the contractor and the Government. LSAR worksheets are prepared and processed concurrently with design to develop a basis for logistics resource planning. The project contractor will prepare * LSAR data sheets formatted in accordance with MIL-STD-1388-2A as tailored by the RFP/SOW. Contractor proposals for substitution of other formats or the alteration or deletion of the specified formats or data elements requires FAA/SEI contractor approval. Where the LSAR data sheets do not provide sufficient space for free text, the contractor will use continuation sheets in the format prescribed by MIL-STD-1388-2A.

b. On-Line Logistics Support Analysis (OLSA) System. The OLSA system provides real-time access to project support LSA information. The LSAR data * is entered into the OLSA data base. The LSAR data can then be sorted by OLSA * and processed as a batch report. The OLSA system is resident on the SEI contractor mainframe for use both by the FAA and the SEI contractor.

(1) The OLSA system permits the FAA/SEI contractor to have full participation in the LSA/LSAR process. The OLSA system uses cathode ray tubes for direct entry and inquiry of data to and from the computer files. Consequently, the FAA/SEI contractor will have access to all LSA data provided by the project contractor.

(2) The OLSA data base will be populated using the Government-approved LSAR data. The method for transmitting data can be one of several ways, depending upon the ADP capabilities of the contractor. Data may be transmitted by magnetic tape or hard-copy data sheets. Once the LSAR data is approved and resident in the OLSA system, updates will be made as required to incorporate design changes.

* 19. NAILS MANAGEMENT TEAM (NAILSMT). A NAILSMT is formed to assist the * program/project manager in planning, monitoring, and controlling a project contractor's NAILS activities.

a. NAILSMT Responsibilities.

* (1) Developing RFP/SOW logistics and training tasks. *

(2) Evaluating proposals.

* (3) Assisting in the negotiations pertaining to NAILS activities. *

* (4) Conducting formal and informal incremental reviews of the contractor's NAILS program. *

(5) Approving all LSA tasks.

* (6) Evaluating LSA data. *

(7) Providing direction to the contractor on matters pertaining to logistics support.

(8) Resolving supportability issues and concerns.

* (9) Assessing the NAILS program. *

(10) Providing formal comments based on assessments of program and design reviews.

* (11) Establishing an effective working interface with the contractor in order to achieve NAILS goals. *

* b. NAILS Implementation Guide. The NAILS Implementation Guide (ATC-86-0057) provides the guidance and procedures required to develop and execute a NAILS program. The NAILS Implementation Guide should be used by the NAILSMT for determining the requirements for their particular project applications. *

20. NAILSMT COMPOSITION AND RESPONSIBILITIES. The NAILSMT shall be composed of FAA headquarters/Aeronautical Center/FAA Technical Center and SEI individuals highly qualified in the logistics disciplines. Primary team
* members must be designated for each NAILS program. Support members shall be * identified, to assist in their areas of expertise, as required. Each contractor executing a NAILS program is required to establish an in-house NAILSMT comparable to the Government team and functioning in accordance with the NAILS Master Plan. NAILSMT composition and responsibilities are outlined in figure 2-3.

21.-25. RESERVED.

FIGURE 2-3. ILSMT COMPOSITION

Function	Type Member	Organization	Responsibility
NAILSMT Chairman	P	Program/Project Manager (APM/AAP)	Chair, Plan, and Coordinate all NAILS Functions
	P	APM-100	Assist the NAILSMT Chairman
	P	SEI Contractor	Assist the NAILSMT Chairman
NAILSMT Secretariat	P	SEI Contractor	Record Meeting Minutes, Track Action Items
Maintainability	S	APM-120 SEI Contractor AAC Depot	Maintainability Interface
Reliability	S	APM-120 SEI Contractor ACT-500	Reliability Interface
Supply Support/ Provisioning	S	AAC Depot SEI Contractor	Spares and Repair Parts and Other Supply Support Requirements
Support Equipment	S	APM-120 SEI Contractor AAC Depot APM-150 APM-160	Requirements Definition and Procurement

P - Primary Member

S - Support Member (will support NAILSMT on an "as-required" basis)

FIGURE 2-3. ILSMT COMPOSITION (Cont'd)

Function	Type Member	Organization	Responsibility
Training and Training Support - Operations	S	APT-300 AAT-700 AAC-930 SEI Contractor	Operations Training, Identify Requirements and Concepts
- Maintenance	S	APM-110 AAC Depot AAC-940 APT-300 SEI Contractor	Maintenance Training, Identify Requirements and Concepts
Logistics Engineering Analysis Review	S	APM-120 AAC Depot ALG-200 SEI Contractor	Logistics Support
Manpower and Personnel	S	APM-130 APM-110 AAC Depot SEI Contractor	Personnel and Staffing Requirements and Classification
Technical Data	S	APM-120 APM-150 APM-160 SEI Contractor	Development of Manuals
Packaging, Handling, Storage, and Transportation	S	AAC Depot SEI Contractor	Equipment and Spares Packaging, Handling, and Transportation Requirements
Computer Resources Support (CRS)	S	AAC Depot (ATE) APM-120 APM-150 APM-160 ACT-500 ACT-100 SEI Contractor	Support of Computer Resources

FIGURE 2-3. ILSMT COMPOSITION (Cont'd)

Maintenance Support Facilities	S	APM-120 ALG-200 SEI Contractor	Maintenance Support Facilities Requirements
Configuration Management	S	AES-410 SEI Contractor	Configuration Management and Standardization
Life-Cycle Cost	S	APO-200 ALG-200 SEI Contractor	Life-Cycle Cost/ Requirements/Constraints

For the Host Computer and Advanced Automation Systems, APM-240 and APM-250 will perform the functions assigned above to APM-120.

* 26. MAINTENANCE PLANNING. Maintenance planning is the process used to evolve and establish maintenance concepts and requirements that will apply during the life cycle of a NAS subsystem. The maintenance planning element is also the interface point with other organizations regarding matters that bear on system support. It coordinates with system designers to ensure that logistics factors are considered in system design. In many cases, the Maintenance Planning element focuses on the support of hardware. To ensure that the NAILS Maintenance Planning element properly addresses support of software, that subject is specifically addressed in subparagraph f. *

a. NAS Maintenance Requirements. The NAS Plan will introduce newly developed technologies to improve subsystem availability and reliability. The NAS projects focus on controlling the growth of the maintenance work force and operating costs without adversely affecting services provided to the users of FAA facilities. This concept will reduce on-site maintenance through remote monitoring and control of facility parameters. There are two commonly used terms which identify the repair components used in the NAS maintenance concept.

(1) Line Replaceable Unit (LRU). An LRU is the lowest unit to be replaced within the operating system during site level maintenance activities. It is a separate, installable physical package performing a single function or group of closely related functions.

(2) Shop Replaceable Unit (SRU). An SRU is the lowest unit required to repair an LRU at an intermediate or depot maintenance facility.

b. NAS Maintenance Concept. The following maintenance concept is predicated upon Draft Order 6000.27A. The basic NAS maintenance concept is to provide a capability to restore failed systems to full operation as quickly as
* possible. The maintenance system supporting the NAS during this period will * be equipment intensive, rather than personnel intensive, and will rely upon solid-state technology to reduce maintenance expenditures. Through modularization, site maintenance will move from labor intensive on-site repair to LRU replacement. The maintenance system will place emphasis on the detection of faults and failures through remote monitoring of equipment. System operational data will be provided to the MCC where a systems analyst will determine equipment status, provide notification to a work center of equipment malfunction, and aid in determining the required resources necessary for repair of a system. The work center will analyze the failure and identify the resources required to repair the system. Technical personnel will then be dispatched to remove the defective LRU and replace it with a serviceable LRU. Equipment certification will be accomplished, as required, either locally or remotely. The reparable LRU will be returned to the work center for repair
* (intermediate maintenance) or for shipment to the depot. *

c. Repair Level Analysis (RLA). The RLA is an analysis technique used to determine if it is cost-effective to repair or discard a support item. It also provides the information required to determine at which level of maintenance a reparable component can be most economically repaired. It is anticipated that only a small portion of repair decisions will require the use of a formal RLA to assist in repair level determination. A typical RLA decision tree is depicted in figure 3-1.

* d. Levels of Maintenance. Hardware maintenance is performed at three levels: Site, Intermediate, and Depot. The characteristics of the maintenance performed at these levels are outlined in the following subparagraphs. Software maintenance does not fit into the three-level pattern. Software support is covered in paragraph 34, as well as in connection with each of the NAILS elements that provide support for software. *

(1) Site Maintenance. Site maintenance consists primarily of maintenance activities performed on equipment installed in its operating
* environment. Specific maintenance actions to be carried out at the site level * are defined in the ILSP for each supported system.

(a) Site maintenance involves Preventive Maintenance (PM), minor operational adjustments, removal and replacement of unserviceable LRU's, physical inspection, and verification of correct operation.

(b) Site maintenance is conducted by personnel who are stationed at work centers. The equipment involved (the supported equipment) may be located at a remote site, or it may be located very near, perhaps in the same building as the supporting work center. The significant point is that site maintenance is performed on equipment at its operating location, wherever that may be. The chief features of the maintenance system, as applied to hardware at the site level, are:

1. System design will ensure that PM need not be scheduled more often than once every 90 days.

2. Failed system elements will be readily identified, largely
* through Remote Maintenance Monitoring System (RMMS), or built-in-test * (BIT)/BITE, with minimum necessity for fault diagnosis at the site.

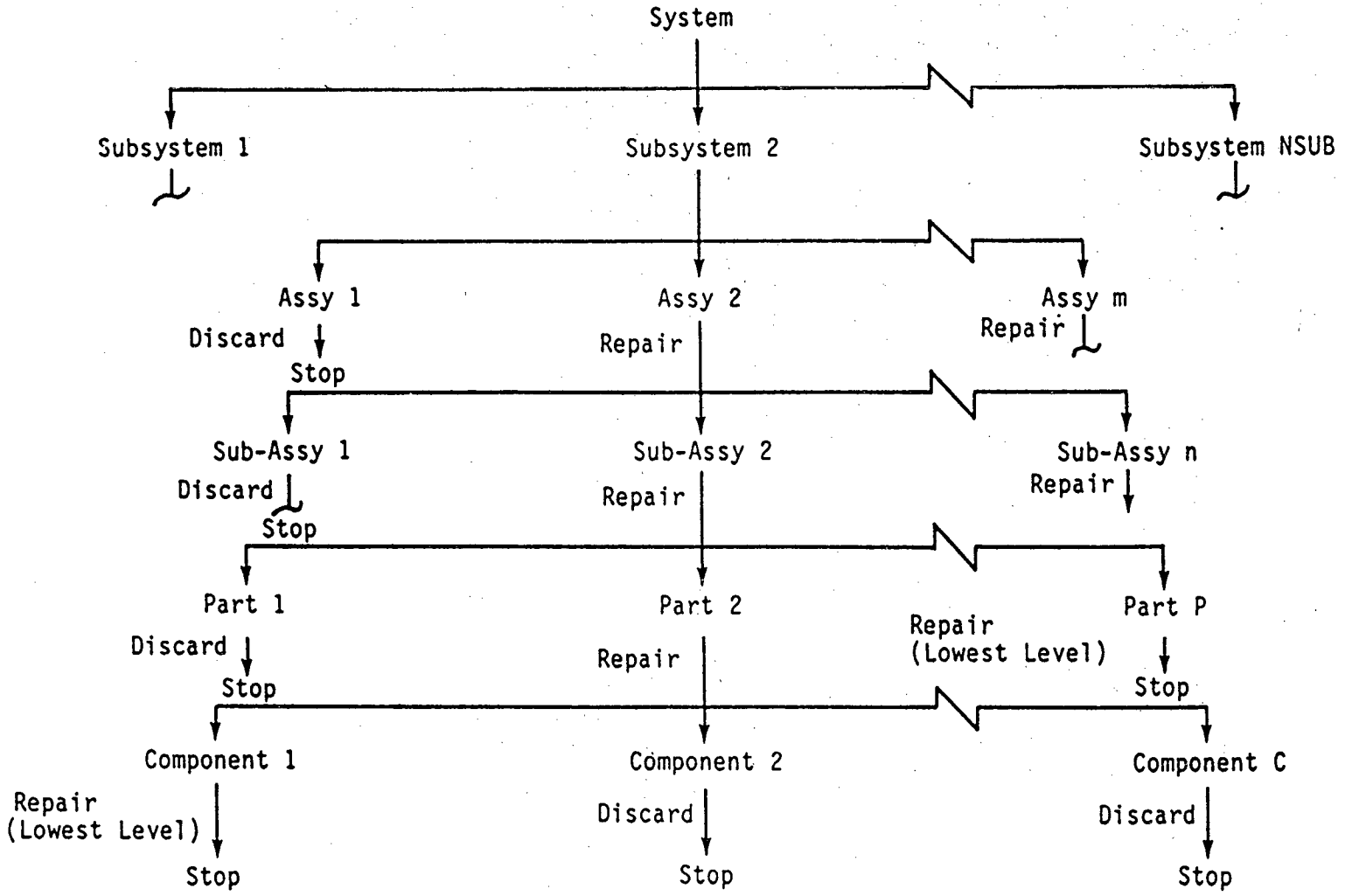
3. Removal and replacement of failed LRU's.

4. System design will provide for rapid verification of the effectiveness of site maintenance activities.

5. Requirements for site maintenance training and SE are minimized.

6. Spares requirements will be limited to replacement LRU's.
* There will be few or no site-level requirements for repair parts. *

FIGURE 3-1. TYPICAL RLA DECISION TREE



(2) Intermediate Maintenance. Intermediate level maintenance tasks * are performed in designated work centers. The chief features of the * maintenance system, as applied to hardware at the intermediate level, are:

(a) Intermediate maintenance requirements will be relatively limited in comparison with current work center workloads.

(b) In-shop test of LRU's and replacement of failed SRU's will only be authorized when cost effective at the intermediate level.

(c) In-shop repair will be authorized on a less-extensive basis than is currently the case. Repair to the piece-part level will be infrequent.

(d) Where repair is authorized at the intermediate level, LRU's will be returned to serviceability primarily through replacement of failed SRU's.

(e) Requirements for training, SE, and supply support will be minimized.

(f) A high proportion of failed items (SRU's or LRU's) will be forwarded to the FAA Depot for further action (repair or discard).

(g) Calibration and repair of SE as required. Where repair or calibration is not authorized, the SE will be forwarded to the depot.

(3) Depot Maintenance. Depot-level maintenance consists primarily of maintenance actions requiring skills and equipment that are specialized and not cost effective to provide at more than one location. The maintenance involved may consist of specialized repair of failed items, overhaul, or periodic refurbishment of equipment. Depot-level maintenance may be conducted at the FAA Depot, at contractor facilities, or in the field by Government or contractor teams. The primary features of the maintenance system, as applied to hardware at the depot level, are:

(a) Repairs will be conducted to the piece-part level on more systems than currently has been the case.

(b) Repairs of failed LRU's and SRU's may require the use of Automatic Test Equipment.

(c) Depot level maintenance by the manufacturer or other commercial source will be employed where cost effective.

(d) Equipment overhaul and refurbishment will continue to be a key depot function.

(e) Depot field teams will continue to be employed on occasions when local capabilities must be reinforced.

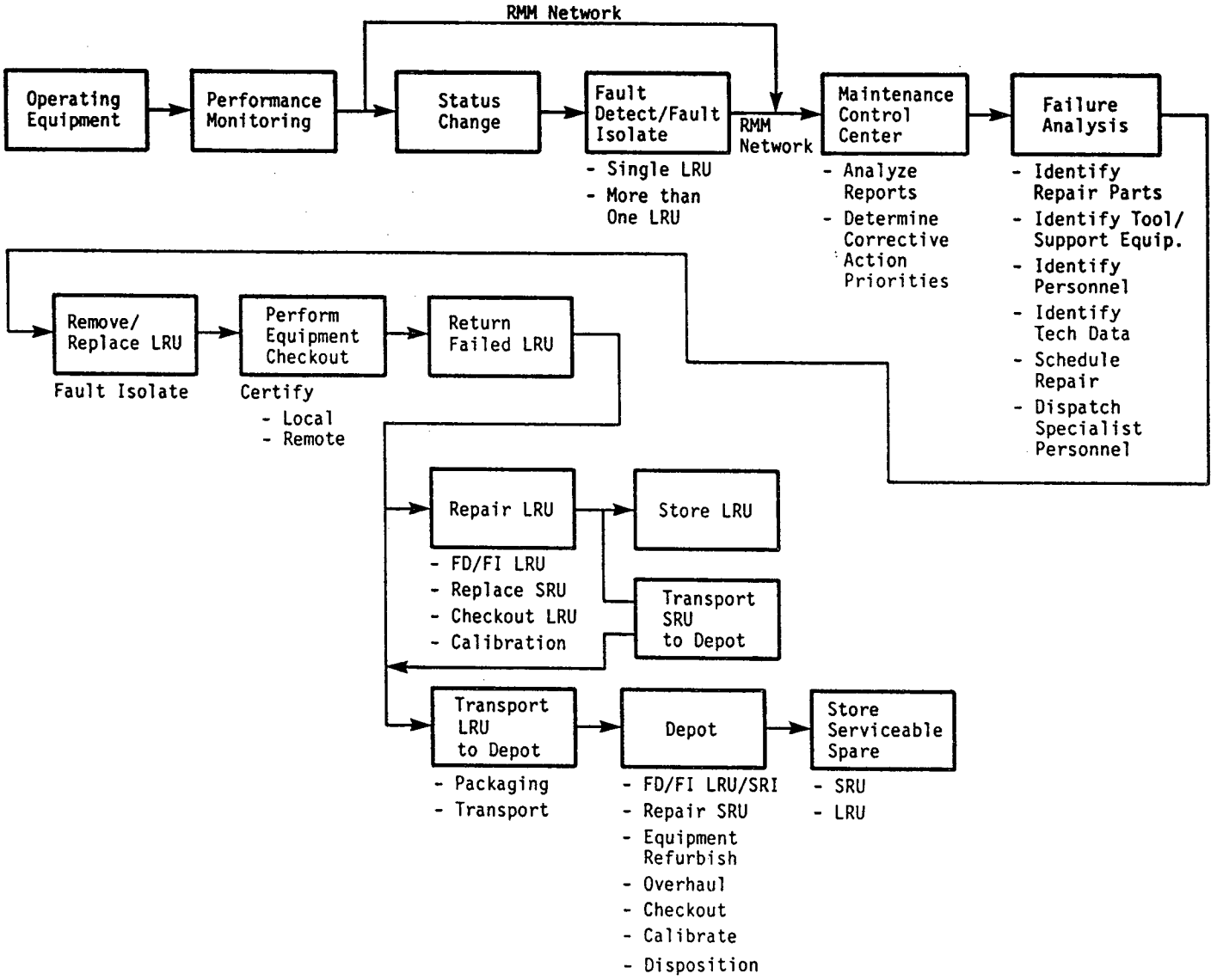
e. Maintenance Scenario. Air Traffic Control (ATC) operating systems will be monitored remotely. The RMMS will provide data to the MCC where the system analyst will determine equipment status and provide notification to a work center of an equipment malfunction and aid in determining required resources necessary to repair the system. Technical personnel will be dispatched to remove the defective LRU and replace it with a serviceable LRU. Equipment certification will be accomplished, as required, either locally or remotely. The reparable LRU will be returned to the repair center for repair or for shipment to the depot for repair or disposition. Figure 3-2 depicts a typical scenario for a repair action.

* f. Software Support. The basic function of Maintenance Planning is the identification of support requirements. Support requirements pertain not only to hardware, but also to software. In regard to software, the primary function of the Maintenance Planning element is to identify the support that is to be provided by the various NAILS elements. Support requirements for software will be identified through the software development plan and through direct coordination with the software development manager. In general, software support is to be provided through various NAILS elements including: Training and Training Support; Technical Data; Support Equipment; and Maintenance Support Facilities. Support that cannot be provided through other NAILS elements, but which can be provided within the scope of the NAILS program, is provided by the CRS element (chapter 3, paragraph 34). *

g. Automated Maintenance Systems.

(1) RMMS. The central provision of the NAS maintenance concept is the ability to monitor remotely the performance of NAS subsystems, measure
* equipment parameters, assist in system certification, predict imminent failures, isolation of faults to the LRU level, and make compensating * adjustments or corrections. The RMMS consists of electronic and electromechanical equipment that monitors, records, and evaluates performance parameters of all NAS subsystems. Maintenance consoles within the MCC and
* terminals at work centers alert systems specialists to critical conditions, * allow system and maintenance specialists to query the system for information, and allow the specialists to perform additional diagnostics from a work center. Portable data terminals will be used by specialists onsite to obtain immediate status information relative to a site facility.

FIGURE 3-2. TYPICAL MAINTENANCE SCENARIO



Based on the collective information obtained through RMMS, actions can be identified to improve facility performance, anticipate equipment failures, and enable the equipment specialist to schedule maintenance actions to minimize failures.

* (2) MCC. An MCC is a central control facility located at the node of an RMMS network. The RMMS will provide the primary interface between the MCC and the facilities and equipment to be monitored. The MCC will be equipped with a variety of voice and data communications links to the Airway Facilities (AF) and Air Traffic (AT) field maintenance and user organizations. With direct access to facilities, work centers, support groups and users, the MCC will have the capability to respond to all quality assurance and maintenance requirements generated within its area of jurisdiction. *

(3) Maintenance Management System (MMS). The MMS is a technical and administrative support system that automates the collection, storage, analysis, and distribution of data. It offers technical field personnel and all levels of management the capability to input, access, and process information. The overall objective of the system is to improve the * cost-effectiveness of maintenance operations in support of the NAS. Data * management functions are performed by the Maintenance Processor Subsystem (MPS). Data entry and display functions are performed by associated input/output devices. Information can be requested on schedule or as needed from field sites, sector and regional offices, Washington headquarters, and the NFSS's. Historical files or problems and solutions on each system or equipment will be produced as required. This historical information will be analyzed to develop trends and predict failure situations.

* 27. SUPPLY SUPPORT. Supply support requirements are identified in the LSA. Supply data resulting from the LSA include: identification of spares, repair parts, and consumables; usage rates and recommended allowances; supply storage requirements; and Source, Maintenance, and Recoverability (SMR) coding. *

* a. Provisioning. Provisioning is the management process used to determine the quantity of support items required to operate and maintain NAS equipment for the initial period of operation. Key usage information and other data needed in the provisioning process are provided by the LSA. The provisioning process identifies the material that should be provided, to support the system under consideration, for a period of time during which usage rates will be determined, and during which the normal working of the supply system can be brought into play to replenish spares, repair parts, and consumables as needed. Decisions as to the spare/repair parts to be procured in support of system operation are made at provisioning conferences. *

(1) Spares Quantification. A spares quantification model is available for use during the provisioning process. This model utilizes a personal computer and is used to aid in determining the total number of spares required to support a NAS subsystem. The model will also be used to determine the stocking location of spares in order to provide optimum operational support.

b. Supply Support Automated Tools. The automated systems described in subparagraphs (1)-(4) are designed to aid in efficient management of supply and maintenance programs.

* (1) OLSA. The OLSA system is used to house the LSA provisioning data which is identified by the contractor and approved by the FAA/SEI contractor. OLSA generates certain documentation used to procure the required supply support resources. *

* (2) Logistics and Inventory System (LIS). The LIS is a centralized inventory management system to be located at the FAA Depot. It will interface with the network of MPS's. This interface will provide an on-line mechanism by which FAA field personnel can request spare and repair parts and materials from the depot. *

(3) Computerized Dispatch System (CDS). The CDS is an automated warehouse system utilized by the depot that will document and store information relating to receipt, storage, movement, and packaging and shipping information. The CDS also retrieves and delivers materials to the packaging location and provides the required shipping documentation.

(4) Personal Property In-Use Management System II (PPIMS-II). PPIMS-II is the updated version of the PPIMS property accountability system. PPIMS-II will improve the management, control, and accountability of FAA in-use personal property. Its goal is to develop standardized data elements, improve property management data, and widen the scope of property records. Uniform standard description of test equipment will be developed and * maintained as part of PPIMS-II. Records will also include new information on * usage data, maintenance costs, lease costs, and performance data. PPIMS-II will automatically track property transferred between regions and will access agencywide data through Washington headquarters.

28. SUPPORT EQUIPMENT. For each system, SE is identified by the LSA for each level of repair. The data produced by the LSA include SE requirements, the maintenance level at which the item is required, the quantity of SE required per work center versus the number of supported systems, a description of the functions and capabilities of the SE, and all calibration requirements.

a. SE Groups. SE is divided into two groups of equipment; common and specialized. Common SE is procured through channels separate from, though often in association with, the acquisition of the supported item, ordinarily under the same procurement contract. Special precautions must be taken to ensure that SE for support of new systems is not procured if equivalent items * already have been provided to work centers. *

(1) Common SE. Common SE consists of equipment available for use on a number of maintenance tasks. It is commercially available without modifications. Equipment such as oscilloscopes, volt/ohmmeters, general purpose signal generators, common ATE, and hand tools will normally fall into this category.

(2) Specialized SE. Specialized SE generally consists of equipment items custom designed to support maintenance activities. Included within this category of equipment are modified commercial items and specialized SE used to perform unique tasks. When economically feasible, specialized SE will have built-in-test capabilities.

b. Automatic Test Equipment (ATE). In order to support specialized maintenance actions and reduce human intervention, an emphasis is being placed on utilizing ATE. Equipment of this type can interrogate the elements and circuits of an electronic system with great rapidity. By identifying faults very quickly, such ATE can increase the speed and thereby reduce the cost of the testing process. Furthermore, by reducing reliance on human understanding and interpretation of electronics systems, and analysis of internal circuitry by technicians, the need for expensive expertise is reduced. ATE is also much more compatible with the testing requirements of miniaturized systems. Because the efficiency of ATE is recognized in the design process, most electronic components today are not testable through traditional manual means.
* ATE systems ordinarily are comprised of both hardware and software. The software is acquired, developed and modified as part of the overall ATE system * acquisition, development, and modification process. Support for the software is provided through the NAILS process that supports the ATE, just as it is provided for any other system by the NAILS program supporting that system.

29. TRAINING AND TRAINING SUPPORT. Maintenance training tasks and training support requirements are identified via the task analysis documented in the LSA.

a. Training. Each project contractor shall deliver a full job task analysis which aids in the determination of requirements for training for that project. The LSA process cites requirements for training equipment, facilities, and curricula. The maintenance concepts, state-of-the-art equipment design characteristics, and a full job task analysis for each system will be the minimum inputs for the determination of training requirements. The definition of the knowledge and skills required at each maintenance level is derived from those inputs and from the staffing criteria for each repair facility.

(1) Certification Training. Certification of service availability and of system parameters will be performed at the facility periodically, as well as after maintenance restoration activities. Remotely located personnel will be capable of monitoring certification data via the RMMS. Those personnel with certification authority must themselves receive certification that they possess the knowledges and skills required to perform their duties.

(2) Site Maintenance Training. Performance of regular PM tasks on the equipment, replacement of LRU's, system tests, and troubleshooting will require that the technical staff be trained in system concepts, equipment operation, alignment procedures, and configuration management.

(3) Intermediate Maintenance Training. The repair of LRU modules at the work center will necessitate the training of sector personnel in the operation of specialized test equipment, operation of diagnostic software, microcircuit soldering techniques, and logistics procedures.

(4) Depot Maintenance Training. Depot level repair will be conducted on modules, components, and SE and will require personnel to be trained in the operation and maintenance of specialized test equipment, diagnostic testbeds, ATE, and software operations.

* (5) Software Training. This element identifies and provides for the training required for personnel responsible for operation and support of the system software, at all maintenance levels, in the same way it identifies and provides for all other aspects of training for the supported system. In this application, "maintenance" does not refer to the acquisition, development, or modification of software. Unless it is system-specific, training in computer programming is professional training and is provided through other-than-NAILS channels. *

(6) Logistics Training. With the planned implementation of the MMS and LIS, training requirements for operation and maintenance of these systems must be identified, planned for, and provided.

(7) Program Support Training. With the proliferation of software-intensive systems being procured for implementation into the NAS, there will be increasing requirements for system support training such as systems analysis, system software officers, and programming positions. Where * such training is system-specific it may be provided through the NAILS program that supports the system concerned. If not system-specific, such training is acquired through channels that provide professional training, rather than through NAILS channels. *

b. NAS Training Plan. The NAS training plan provides summary NAS training information. It identifies projected impacts of the NAS Plan on FAA training, the activities of the NAILS training working group, and the methodology used to develop the NAS project training data base. The training plan is revised and updated on a semiannual basis. In its final form, the NAS training plan will be a single reference source to document the training activities and all planning information affecting NAS projects.

Since the NAS training plan is designed to be a summary level document, detailed supporting documentation for each project is not included. This information is available in the Subsystem Training Plans and and can be obtained from the regional logistics/training representatives.

* 30. DIRECT-WORK STAFFING. *

a. Maintenance Manpower. The direct maintenance manpower required for task accomplishment is identified in the LSA. The principal focus of this logistics element is to identify direct maintenance manpower required for the preventive and corrective maintenance of each NAS subsystem. This identification includes positive determination of the skills required, the number of people involved, and the time necessary to carry out each maintenance task.

* b. Staffing. The direct-work staffing requirements, documented in the LSA, are used by the training and training support element in identifying training requirements. The direct work staffing requirements are also essential inputs to overall FAA human resources planning, which determines the numbers of individuals, and their skills, to be assigned to specific FAA organizations.

31. MAINTENANCE SUPPORT FACILITIES. This element identifies requirements for special or unique facilities if such facilities are required for supporting a NAS system. Such facilities pertain to AF requirements for work spaces. The work spaces (structures) are acquired through FAA real property acquisition channels. The requirements referred to here are system-specific. They pertain to NAILS-defined system support. They do not pertain to facilities used in the acquisition or development of hardware or software, or for the management of those efforts. Those facilities are provided through the acquisition or development program involved, rather than through the NAILS effort.

32. PACKAGING, HANDLING, STORAGE, AND TRANSPORTATION (PHS&T). LSA provides data pertaining to PHS&T support items. This effort provides feedback to design to ensure that support and test equipment, spares, and repair parts are designed (wherever possible) to be compatible with available modes of transportation and existing handling equipment.

33. TECHNICAL DATA. The Technical Data element acquires Technical Manuals for all new or contractor-modified equipment procured by the FAA. These manuals pertain to support of both hardware and software. They are delivered with the equipment. Unless otherwise specified, the Technical Data element provides only published, centrally-stocked, official documents for system maintenance and operation. This documentation is acquired under the provisions of FAA-D-2494B and FAA-SRDS-140-SDS-1.

34. COMPUTER RESOURCES SUPPORT (CRS). This element addresses the support of computer resources by NAILS programs. The computer resources referenced herein include, computers, software, and firmware required as part of the supported system. The policies applied to software apply also to firmware.

a. The primary functions of the CRS element are explained in subparagraphs (1) through (3). *

* (1) This element ensures that the requirements have been identified for support of system software, as well as for support of the related computers.

(2) This element verifies that the NAILS program acquires the necessary support. To the extent feasible, support shall be provided through existing NAILS elements.

(3) This element integrates the efforts of other NAILS elements which provide the categories of needed support.

b. The CRS element provides support for system computer resources that is not provided by other elements and that is within the approved scope of the NAILS program. All CRS requirements shall be identified in the project ILSP and ISP, or in the documentation referred to in the CRS chapter of those plans.

c. In the event that requirements for software support exist beyond those indicated above, the matter shall be referred to higher authority. The higher authority concerned shall include at least the acquisition program manager, the NAILSMT leader, and the SEI contractor logistics group leader. The anticipated scope of such additional software support would include functions ordinarily categorized as acquisition, development, or modification of software. In such an instance, the acquisition, development, or modification would be authorized under controlling documentation other than a NAILS Plan. Such documentation ordinarily would consist of a Software Development Plan or other comparable document. *

35.-40. RESERVED.

APPENDIX 1. ACRONYMS AND ABBREVIATIONS

AAC	Aeronautical Center
ACCC	Area Control Computer Complex
ACT	FAA Technical Center
ADP	Automatic Data Processing
AES	Systems Engineering Service
AF	Airway Facilities
AFS	Airway Facilities Sector
ALG	Acquisition and Materiel Service
APM	Program Engineering and Maintenance Service
APT	Office of Personnel and Technical Training
ARTCC	Air Route Traffic Control Center
AT	Air Traffic
ATC	Air Traffic Control
ATE	Automatic Test Equipment
ATR	Air Traffic Plans and Requirements Service
BIT	Built-in-Test
BITE	Built-in-Test Equipment
CBI	Computer Based Instruction
CDG	Course Design Guide
CDS	Computerized Dispatch System
CRT	Cathode Ray Tube
DRS	Dedicated Repair Service
F&E	Facilities and Equipment
FAA	Federal Aviation Administration
GNAS	General NAS Sector
ILSP	Integrated Logistics Support Plan
ISD	Instructional System Development
ISP	Integrated Support Plan
LCN	LSA Control Number
LIS	Logistics and Inventory System
LRU	Line Replaceable Unit
LSA	Logistics Support Analysis
LSAP	Logistics Support Analysis Plan
LSAR	Logistics Support Analysis Record
MCC	Maintenance Control Center
MDT	Maintenance Data Terminal
MMS	Maintenance Management System
MPS	Maintenance Processor Subsystem

NAILS	National Airspace Integrated Logistics Support
NAILSMT	National Airspace Integrated Logistics Support Management Team
NAS	National Airspace System
NFSS	National Field Support Sector
OLSA	On-line Logistics Support Analysis
PHS&T	Packaging, Handling, Storage, and Transportation
PLATO	Programmed Logic for Automatic Teaching Operations
PM	Preventive Maintenance
RDCC	Research and Development Computer Complex
RFP	Request for Proposal
RLA	Repair Level Analysis
RMMS	Remote Maintenance Monitoring System
SE	Support Equipment
SEI	System Engineering and Integration
SFO	Sector Field Office
SFU	Sector Field Unit
SMR	Source Maintenance and Recoverability
SOW	Statement of Work
SRC	Sector Repair Center
SRU	Shop Replaceable Unit
SSCC	System Support Computer Complex
STP	Subsystem Training Plan
TASCS	Training Analysis Support Computer System
TCCC	Tower Control Computer Complex

APPENDIX 2. APPLICABLE DOCUMENTS

Order 1100.2B	FAA Organization - FAA Headquarters
Order 1100.5	FAA Organization - FAA Field
Order 1320.1C	FAA Directives System
Order 1800.8E	NAS Configuration Management
Order 3000.6	Training
Order 3000.10	Airway Facilities Maintenance Technical Training Program
Order 6000.10	Airway Facilities Service Maintenance Program
Order 6000.27	Maintenance Philosophy Steering Group Report Update
Order 6000.30	Airway Facilities Service Policy Decisions for the Maintenance Program of the 1980's
FAA-E-2734	MMS Specification
FAA-STD-021	Configuration Management (Contractor Requirements)
FAA-STD-028	Contractual Training Programs
NAS-MD-001	NAS Subsystem Baselined Configuration and Documentation Listing
11/1/85 Draft	LIS Conceptual Design Document
06/86	NAS Plan Facilities, Equipment and Associated Development

Appendix 2

10/84 Draft	MMS Program Plan
06/84 Draft	MMS Interface Requirements Document
05/01/86	LIS Interface Control Document
12/17/84	Maintenance and Operations Support Plan
MIL-STD-1369	Integrated Logistics Support Program Requirements
MIL-STD-1388-1A	Logistics Support Analysis
MIL-STD-1388-2A	DOD Requirements for Logistics Support Analysis Record
MIL-STD-1521	Technical Reviews and Audits for Systems Equipment and Computer Software
MIL-STD-1561	Provisioning Procedures, Uniform DOD
DOD 4100.38-M	Provisioning and Preprocurement Screening Procedures
DOD 5000.39	Acquisition and Management of ILS for Systems and Equipment

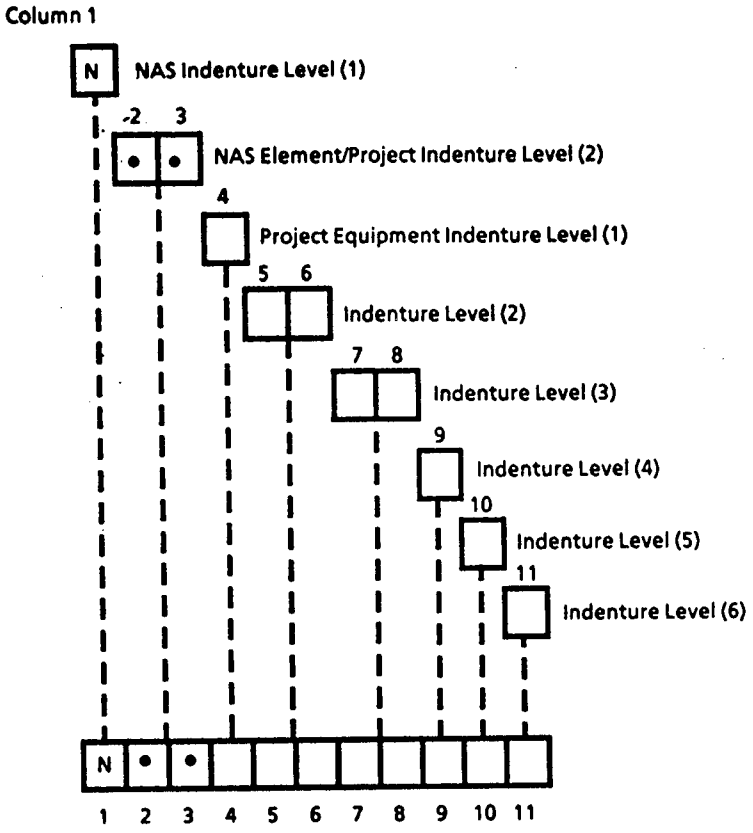
APPENDIX 3. LCN STRUCTURE

The following figures identify the NAS LCN structure. This appendix also identifies the LCN assignments for all NAS projects. Due to the evolving nature of the NAS, changes, additions, and deletions to the LCN assignments should be expected. When assigning LCN's or requesting current LCN structures, contact the SEI contractor, Logistics Engineering group.

The purpose for developing a structured LCN process for the NAS is twofold. First, by assigning a unique LCN for each NAS project the capability exists to track a project's top-down-breakdown structure independently of other NAS projects. Second, a unique LCN structure allows for the automation of LSA data for use in the OLSA system.

Appendix 3

FIGURE 1. Logistics Control Number (LCN) Structure

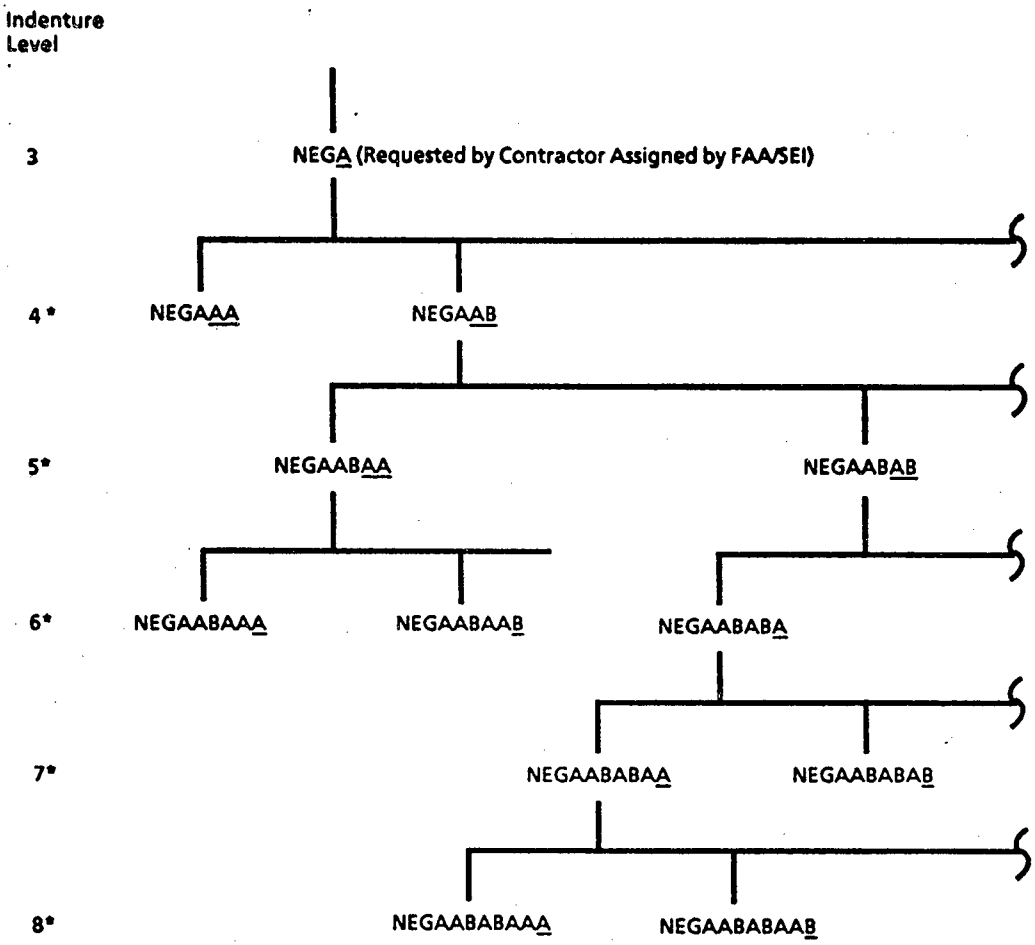


•Controlled and Assigned by FAA/SEI

*Column 4 alpha character "T" is reserved for all training-unique requirements for the subsystems identified.

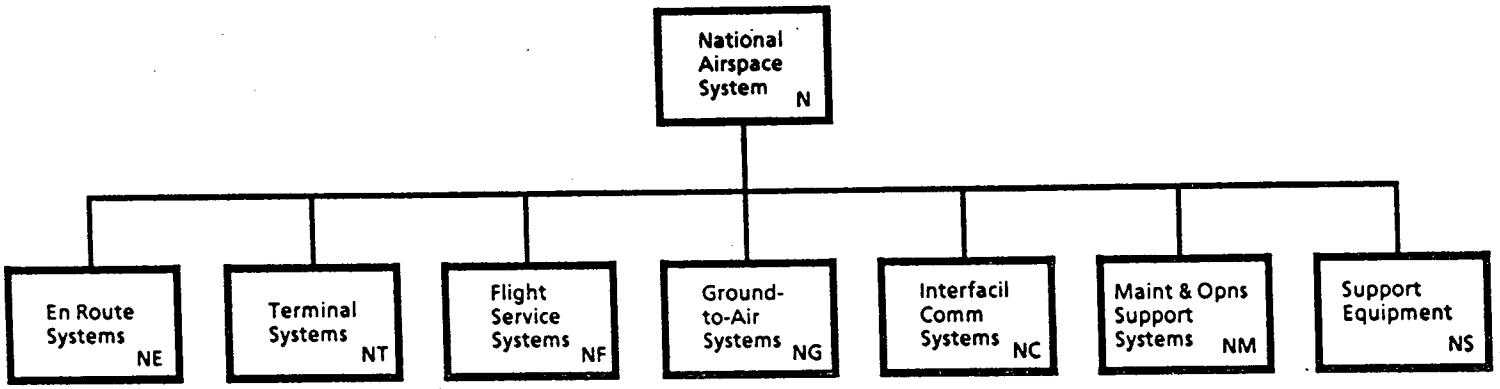
Indenture Level 4 and on, can be one or more characters as agreed upon between the contractor and FAA/SEI.

FIGURE 2. NAS Contractor LCN Assignment Method



*Indenture level 4 and on can be one or more characters as agreed upon between the contractor and FAA/SEI.

FIGURE 3. NAS Top Level LCN Assignments



(Air Traffic Control Systems)

LCN Assignments

N	E										En Route Systems
N	T										Terminal Systems
N	F										Flight Service Systems
N	G										Ground-to-Air Systems
N	C										Interfacility Communications Systems
N	M										Maintenance and Operations Support Systems
N	S										Support Equipment

FIGURE 4. NAS En Route Systems LCN Assignments

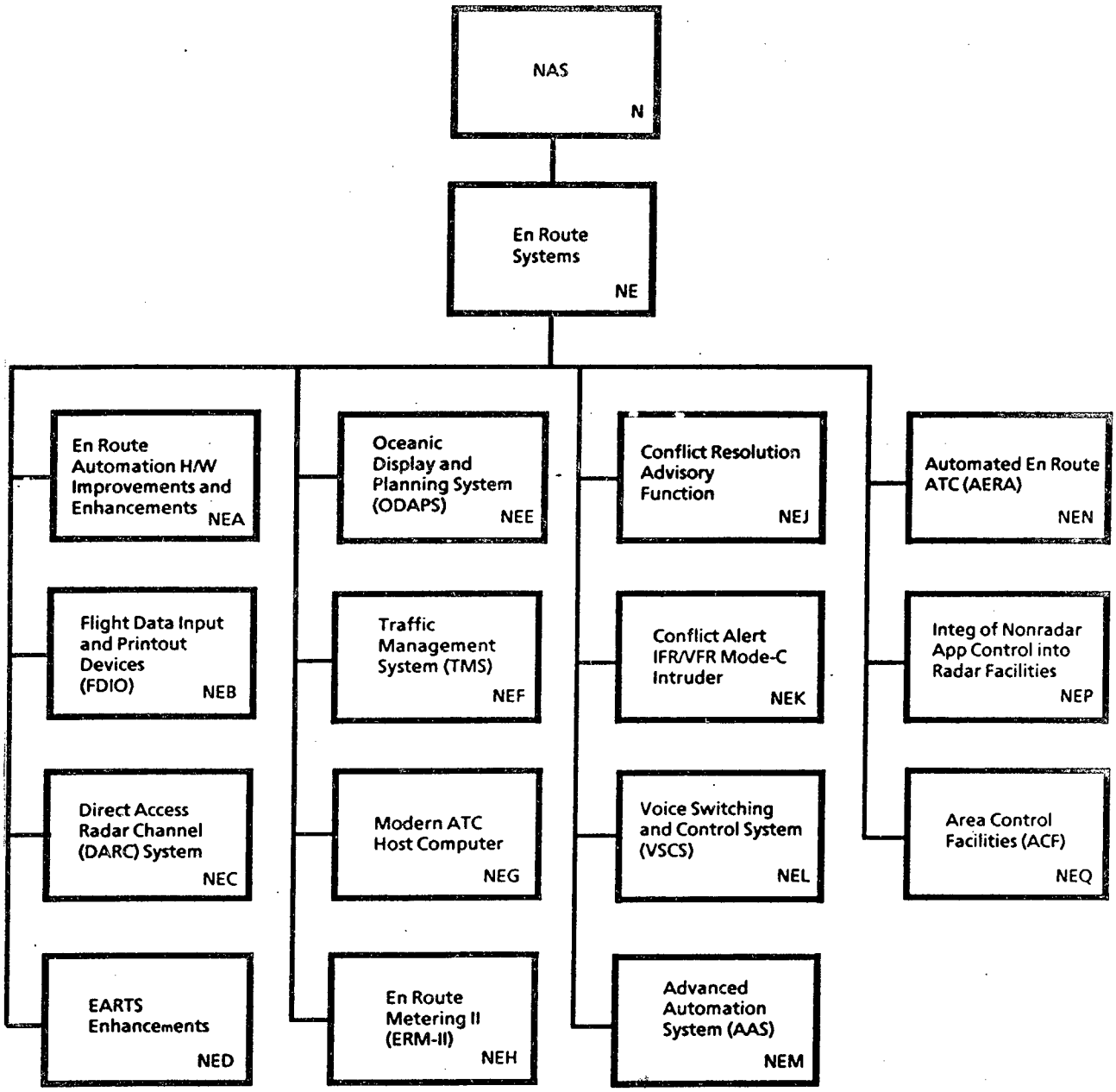


FIGURE 5. NAS Terminal Systems LCN Assignments

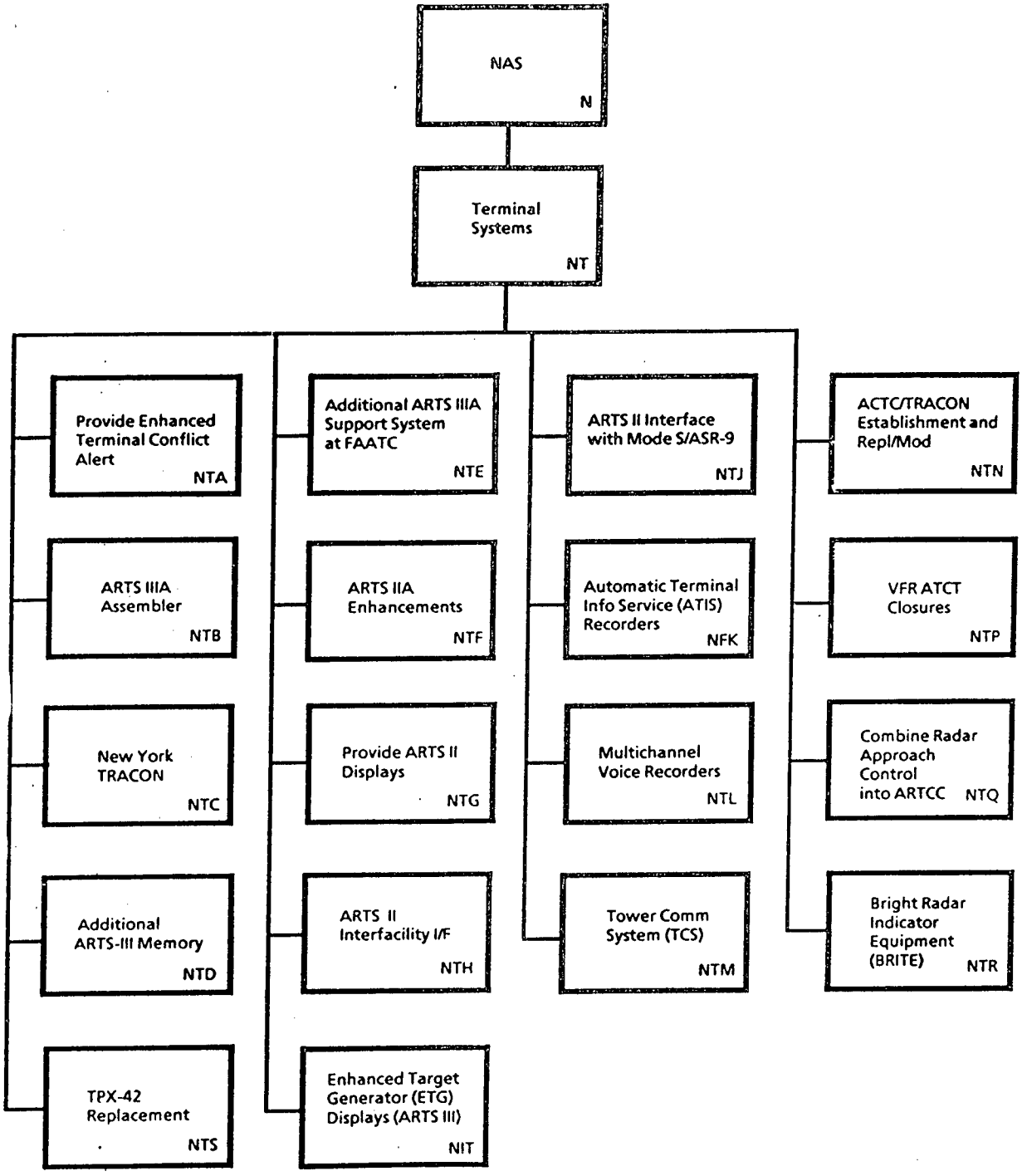


FIGURE 6. NAS Flight Service Systems LCN Assignments

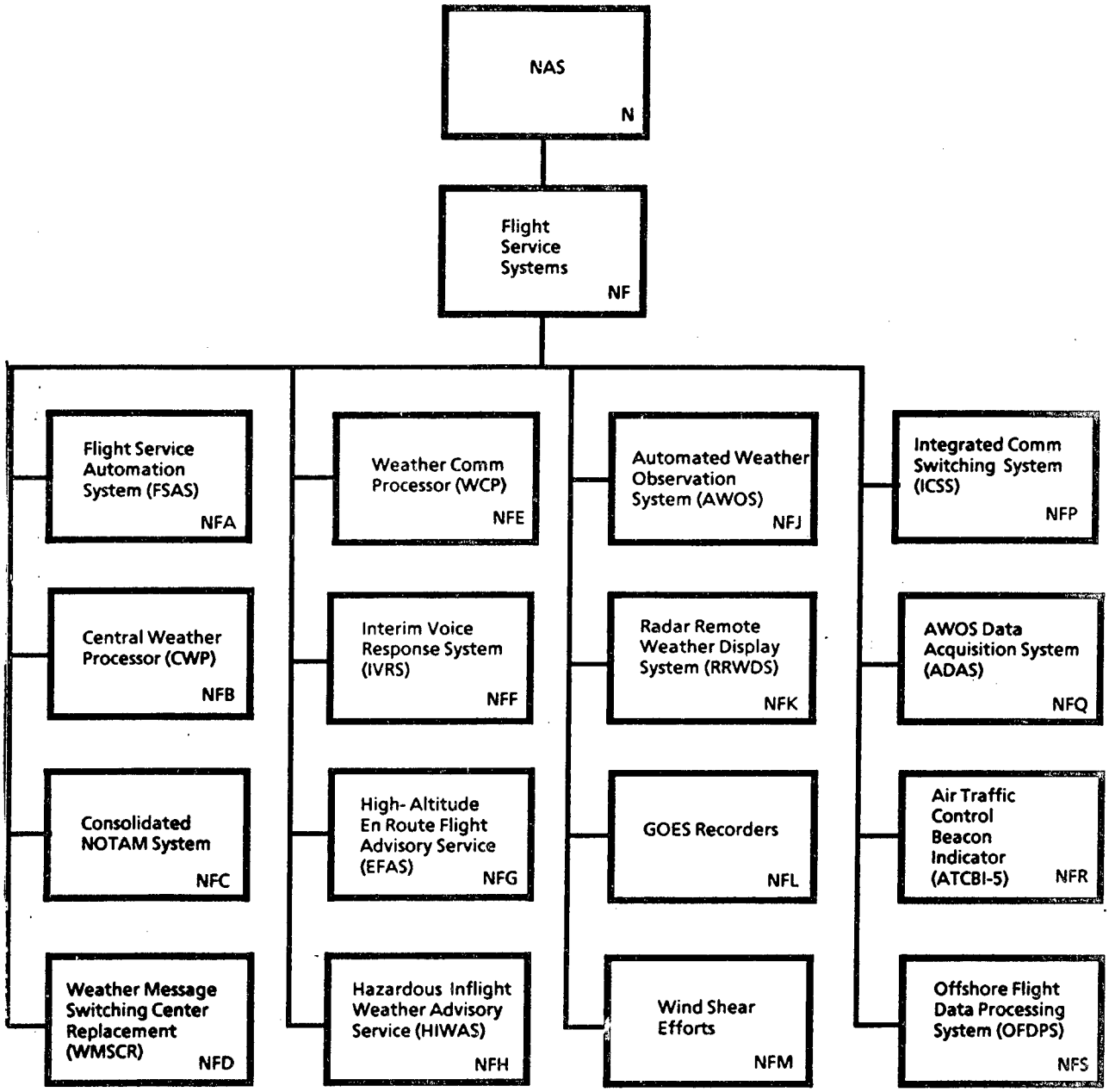


FIGURE 7. NAS Ground-to-Air Systems LCN Assignments

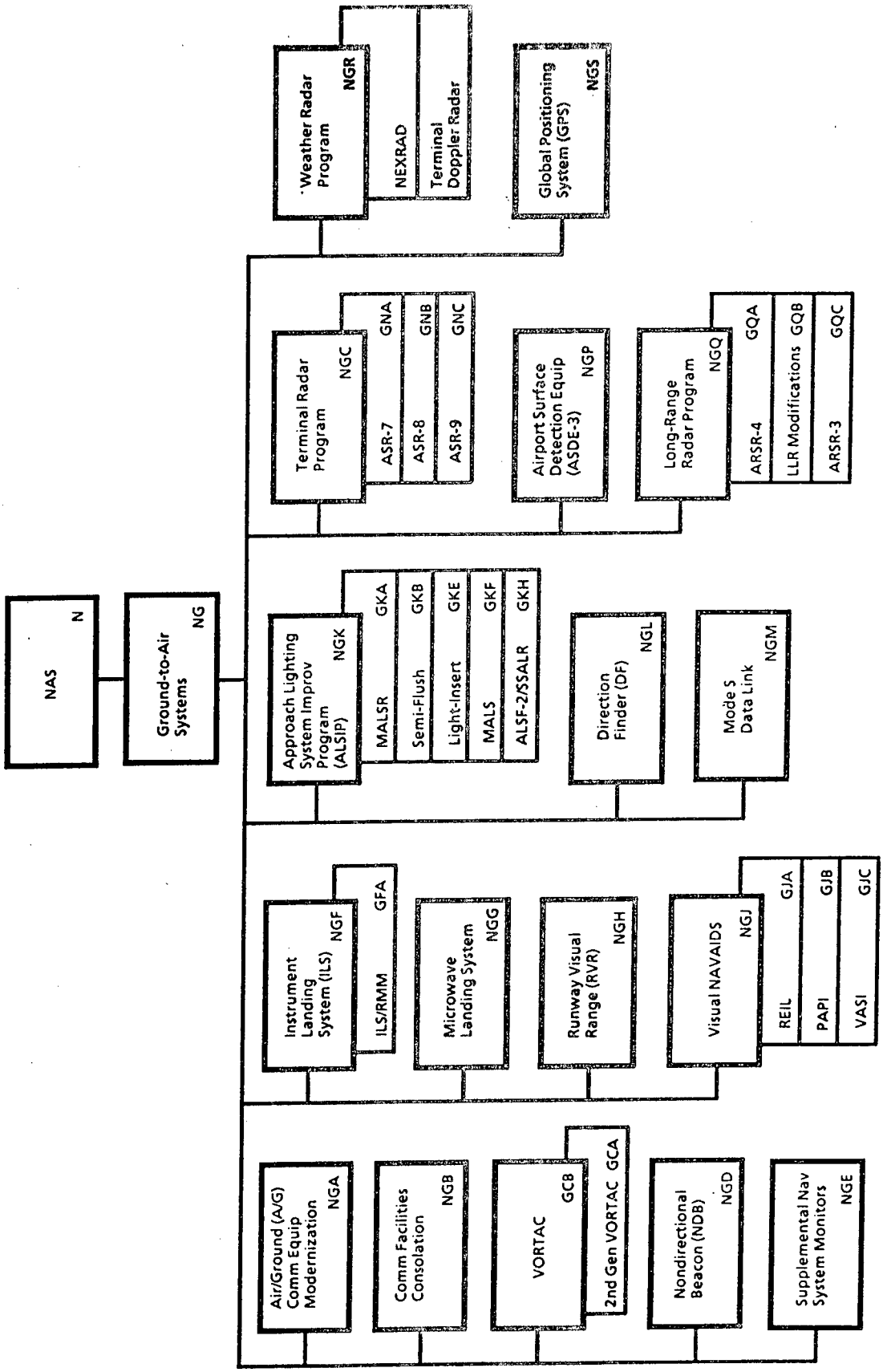


FIGURE 8. NAS Interfacility Communications Systems LCN Assignments

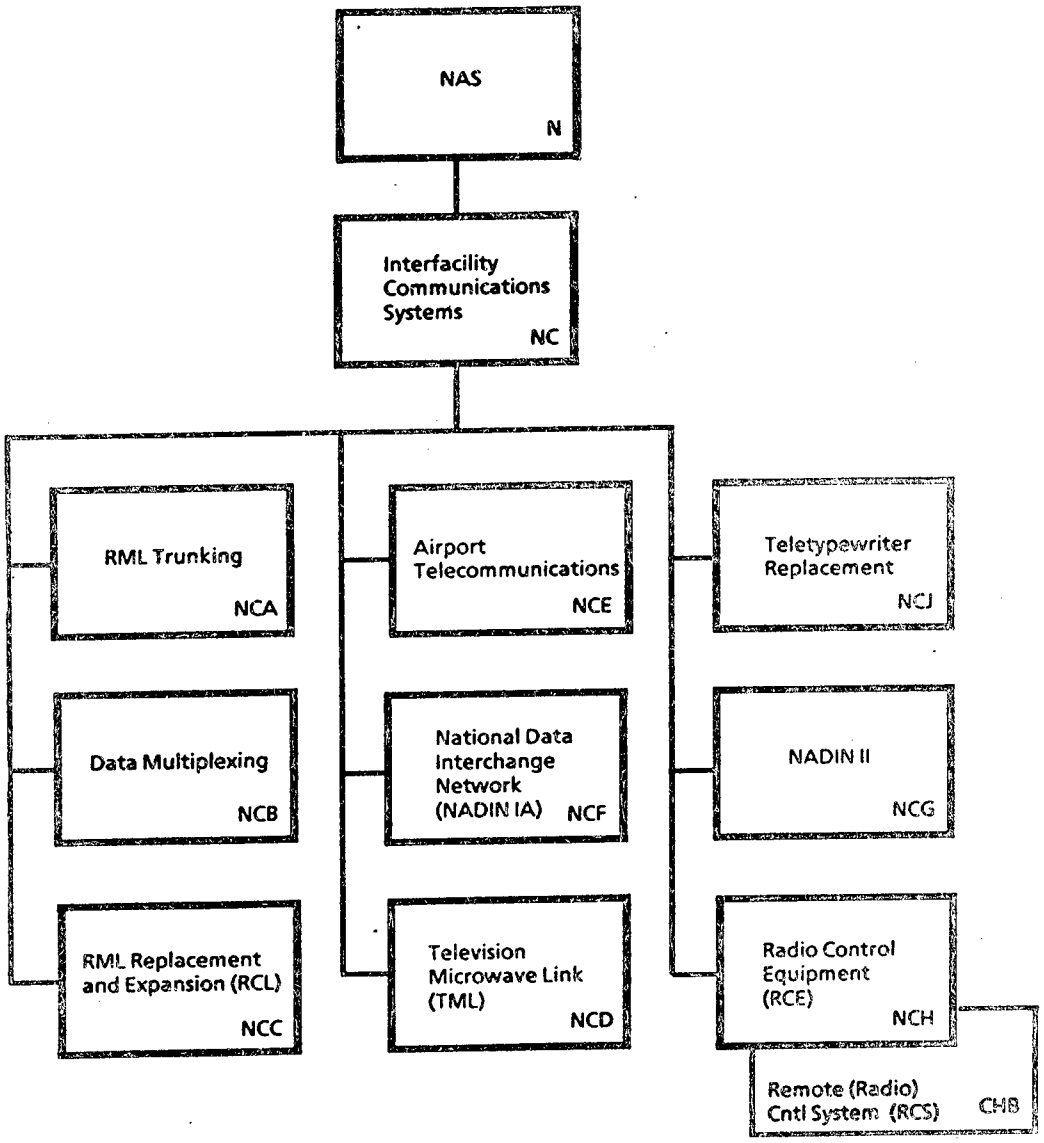


FIGURE 9. NAS Maintenance and Operations Systems LCN Assignments

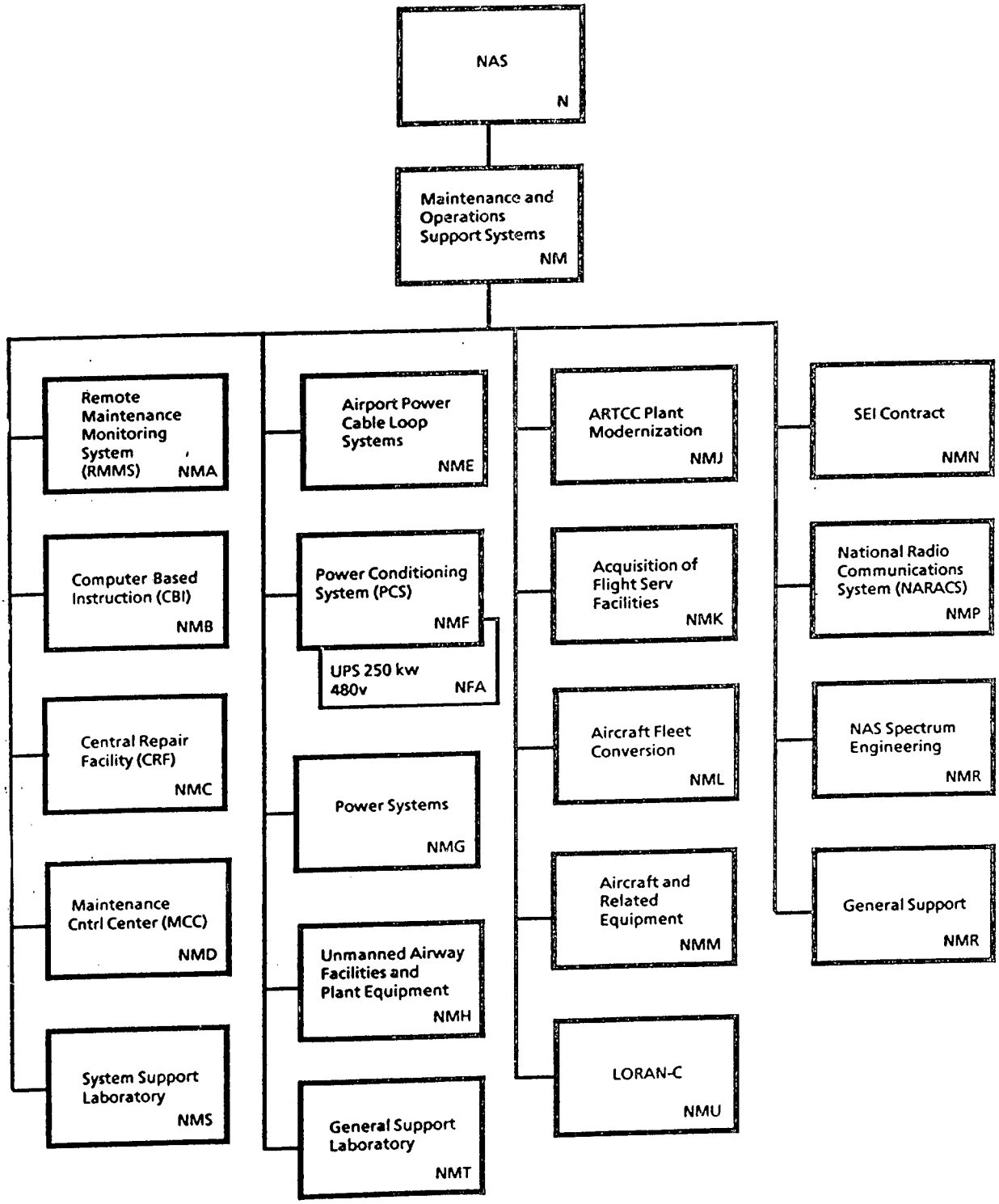
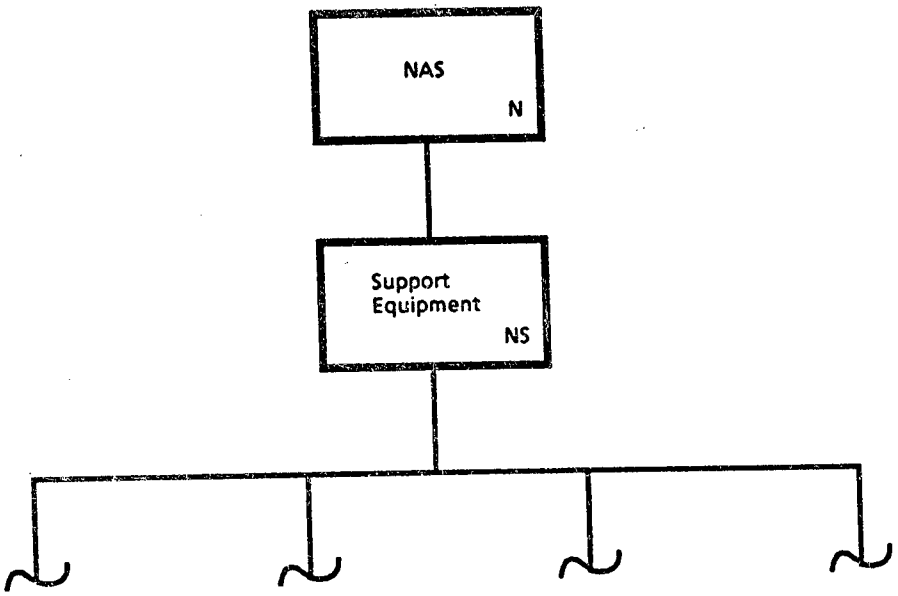


FIGURE 10. NAS Support Equipment LCN Assignments



Identifies all NAS-Unique Support Equipment Requiring LSA; LCNs Requested by Contractors and Approved by FAA/SEI